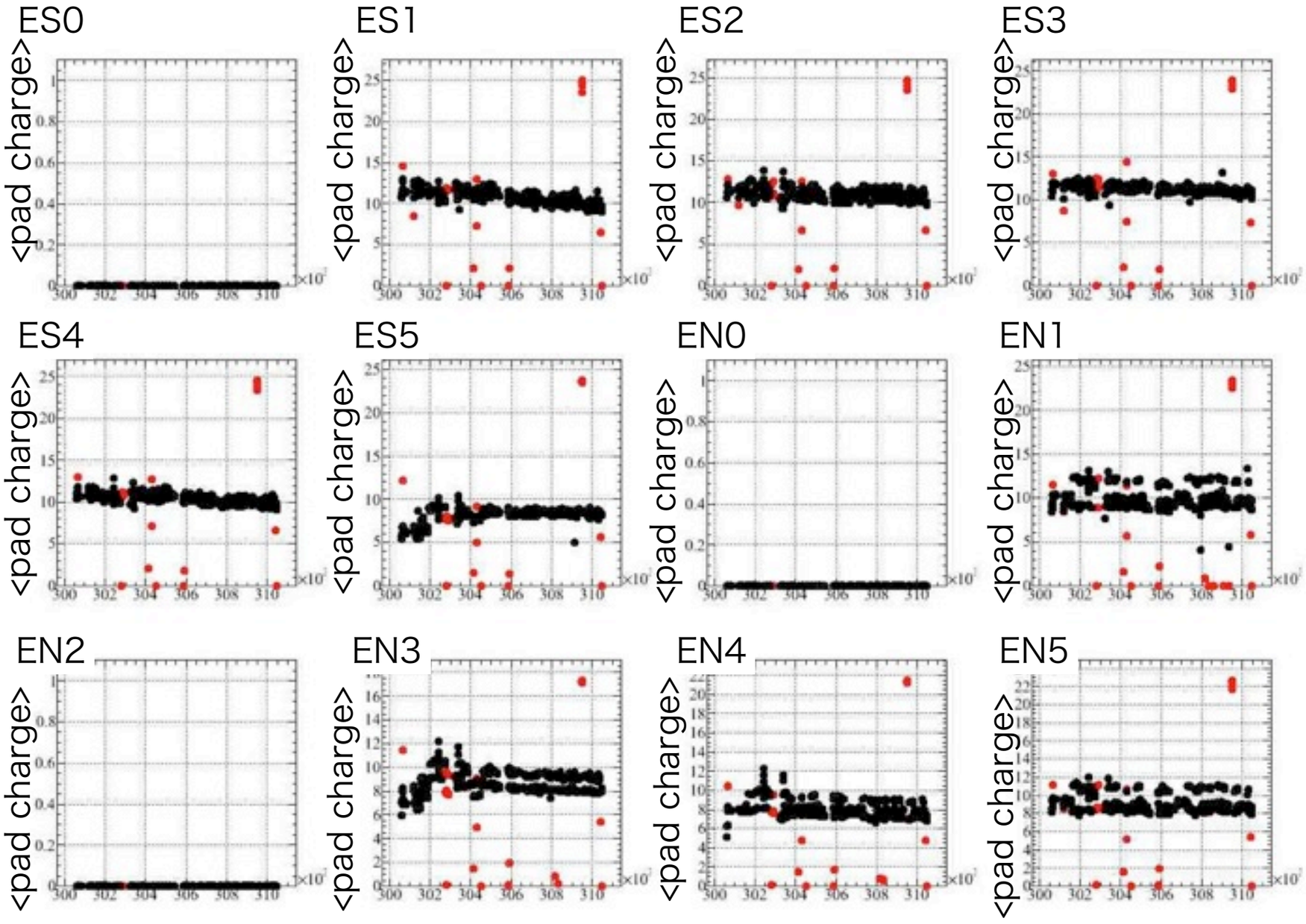
QA of HBD

Yosuke Watanabe

HBD QA (East)

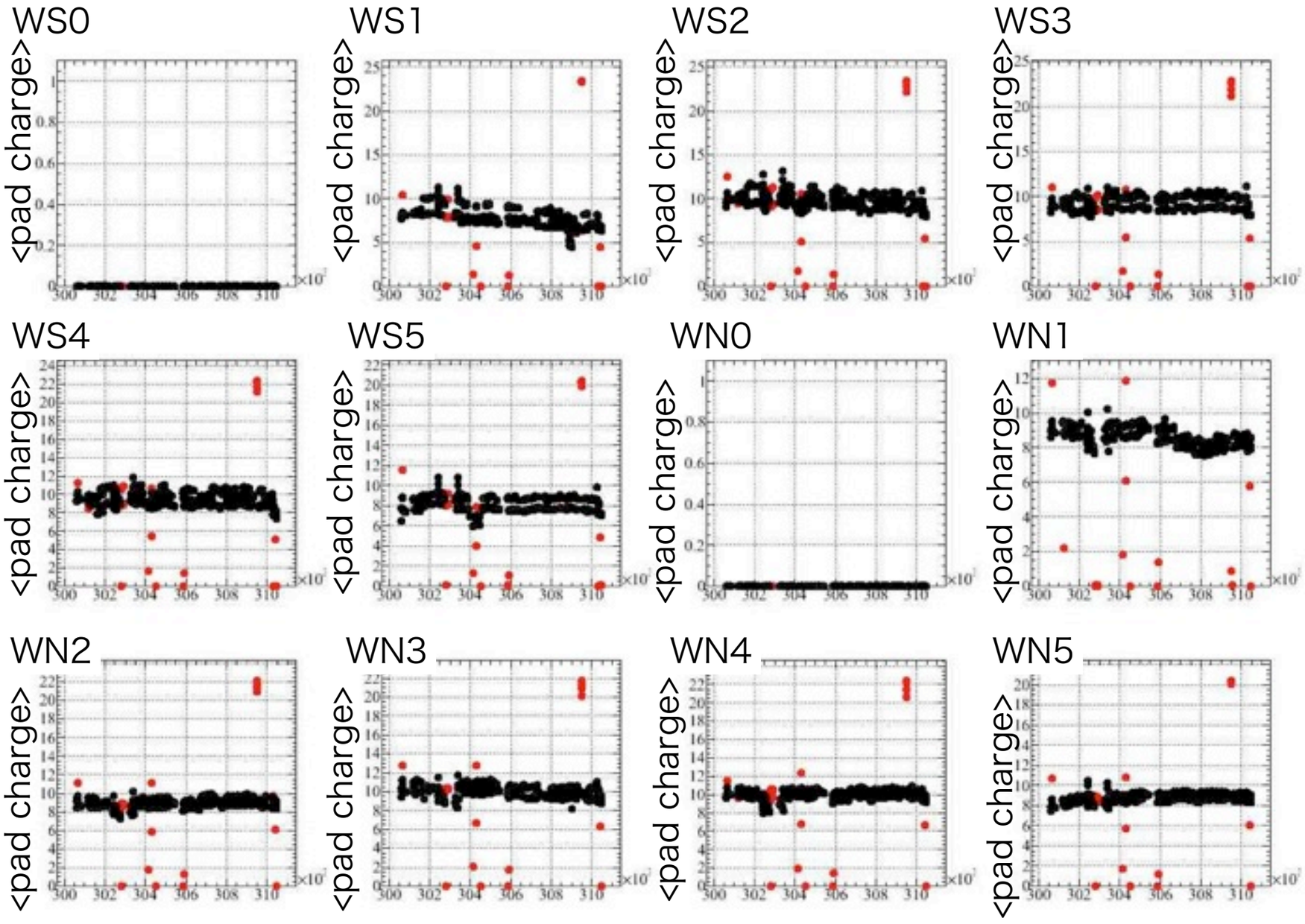
<pad charge> [pe]= Average charge per hexagonal pad for the events with bbcq>1000



slide from PLHF meeting

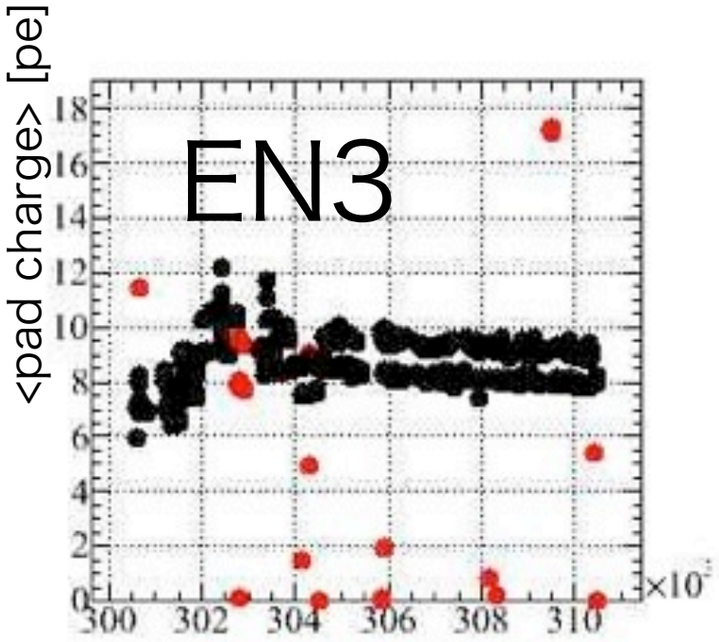
HBD QA (West)

<pad charge> [pe]= Average charge per hexagonal pad for the events with bbcq>1000



slide from PLHF meeting

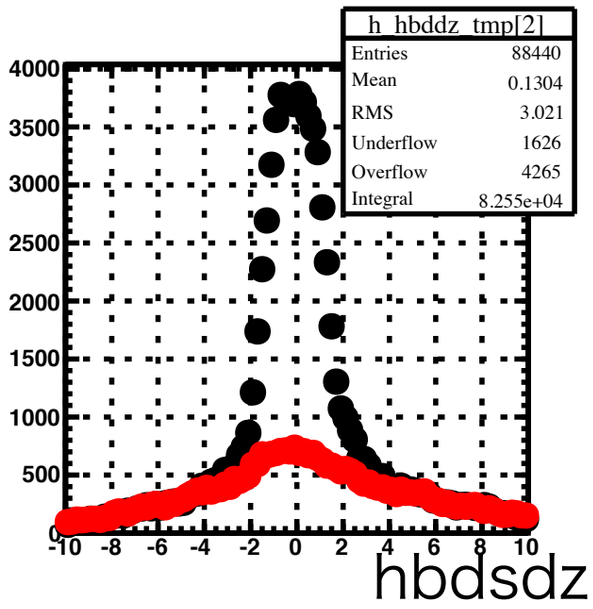
Questions

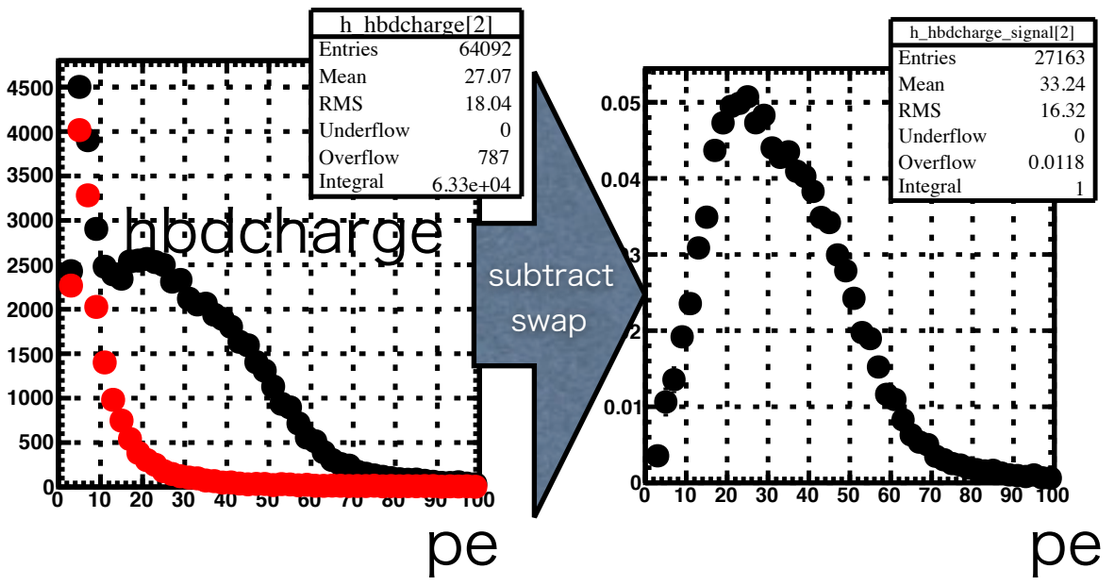


1. Two line structure
2. Slope
3. Jump (around 302000)

- Does a true electron signal show the same behavior?
  - Problem of quantum efficiency(?)
  - Beam Property

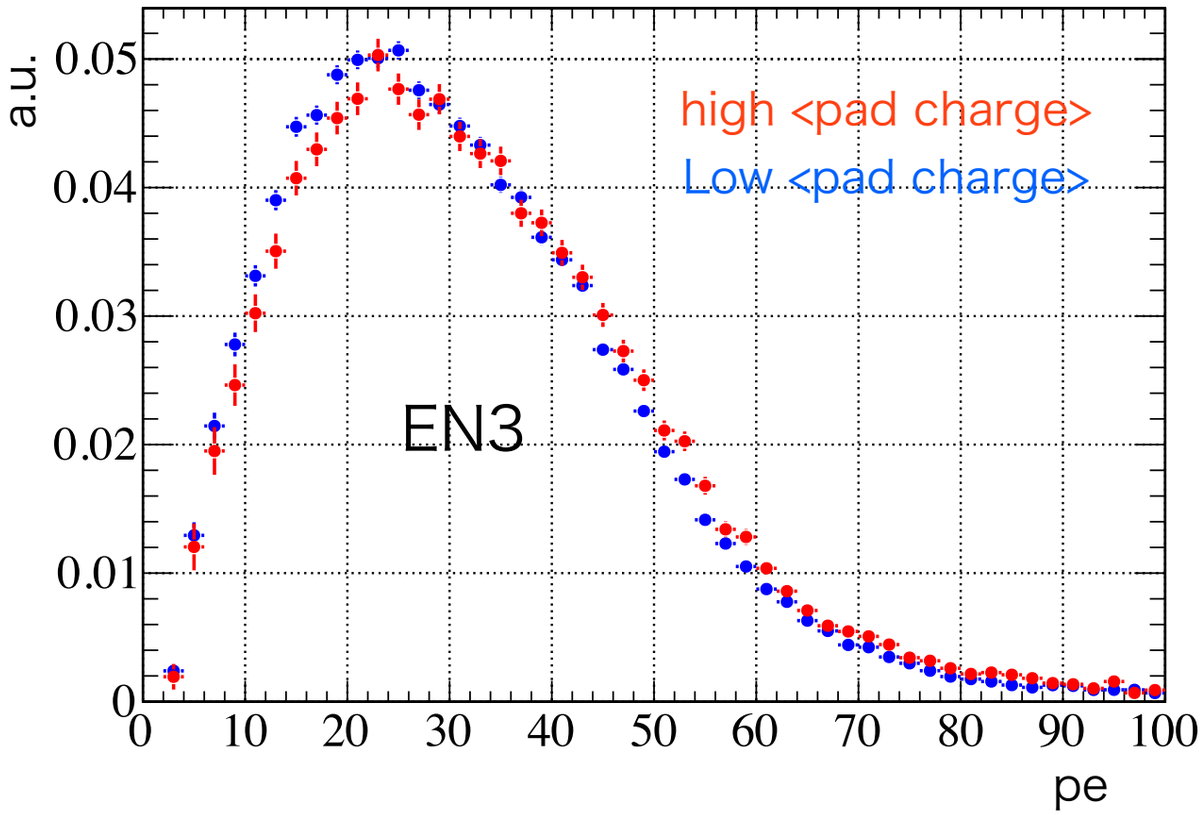
Extraction of an electron signal

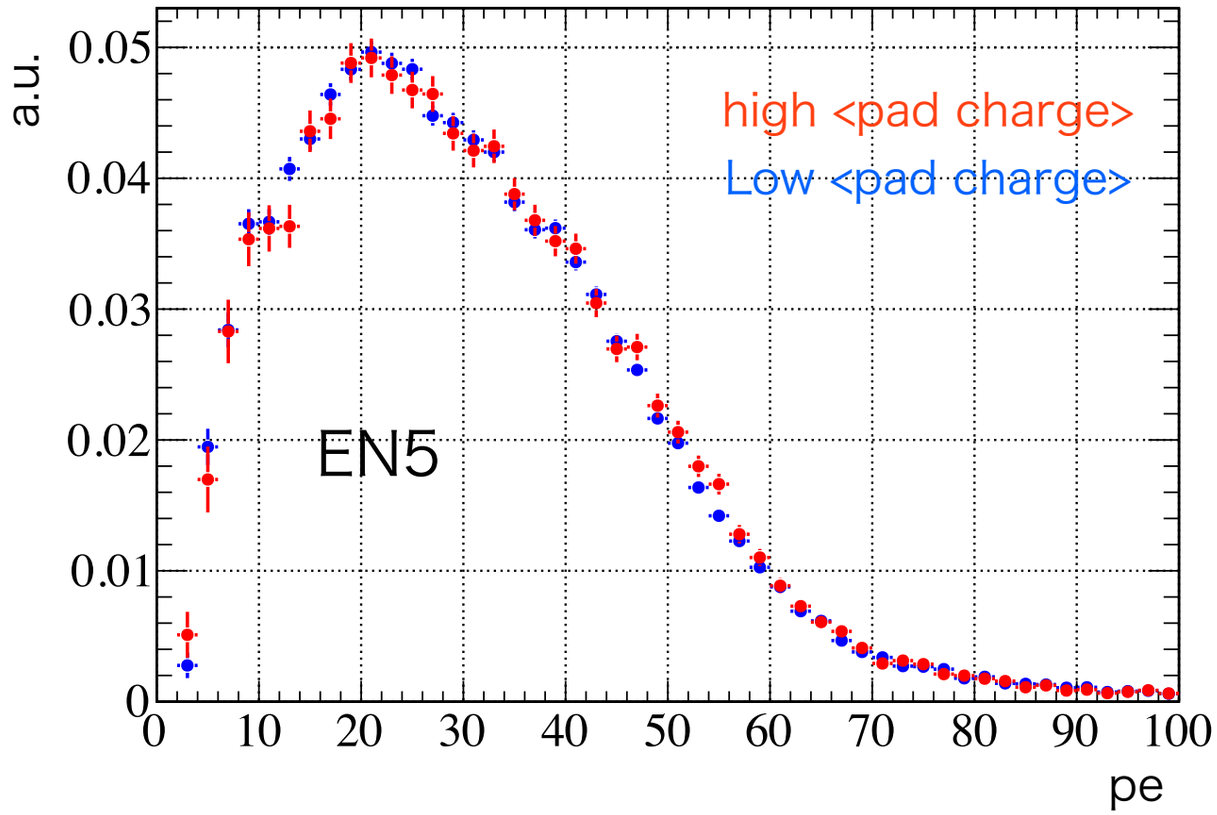




- 200GeV, Centrality: 60-92%
- WisClusterizer in CVS
- CA eid cut in backup
- The background is estimated by swapping technique.
- The background is normalized to the matching distributions tail-to-tail
- The hbdcharge distribution is obtained after 3 sigma matching cut

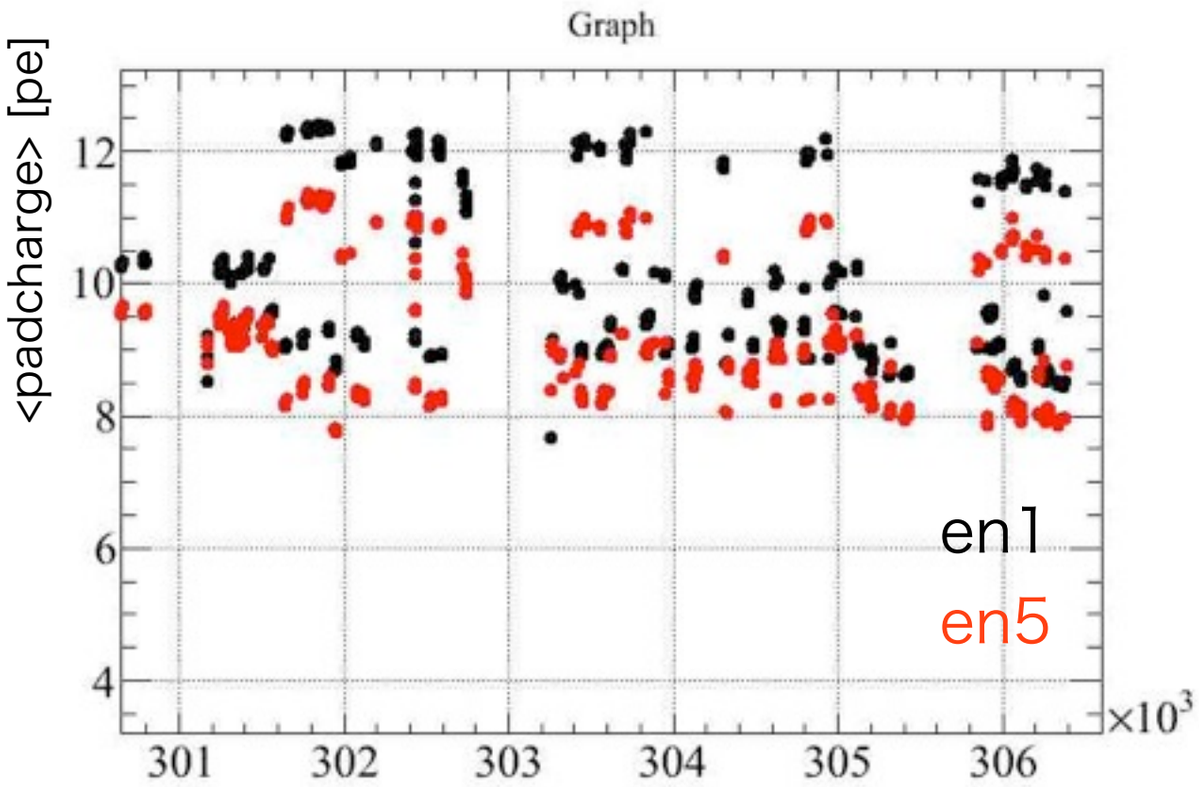
Two line structure 1

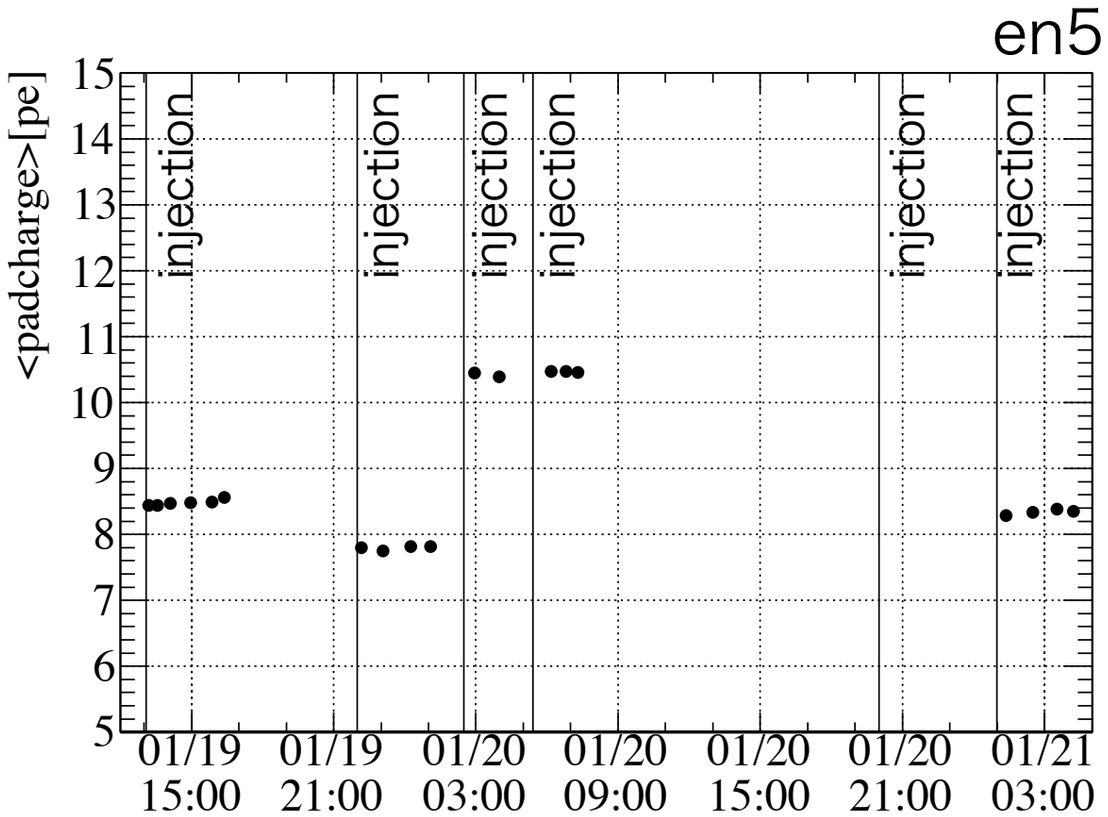




- Compare an electron signal in the high <pad charge> group and low <pad charge> group
- An electron signal in the high <pad charge> group and low <pad charge> group seems similar
  - Two line structure must be due to beam property

Two line structure 2

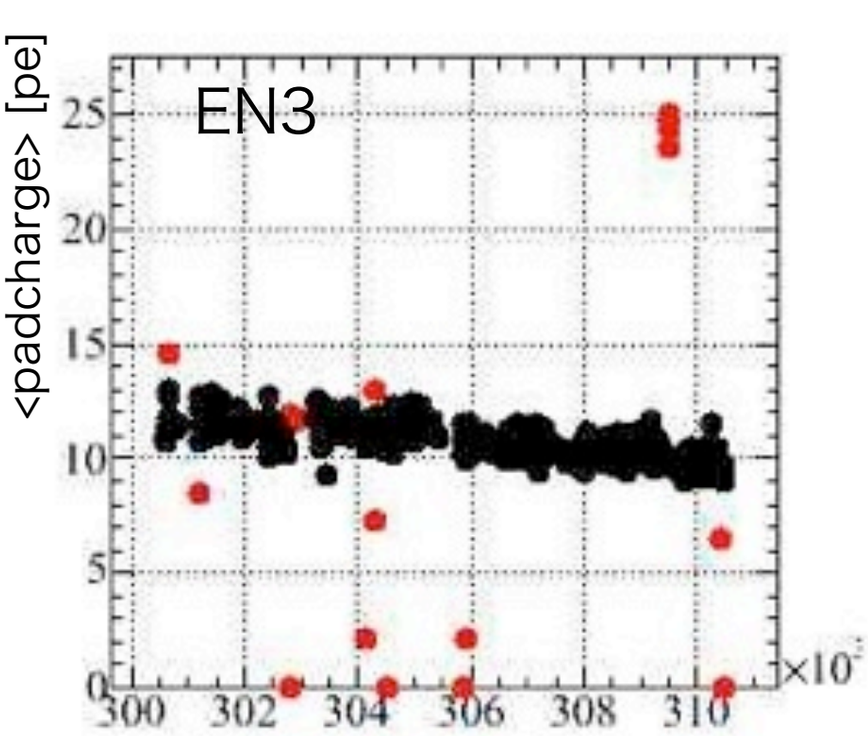


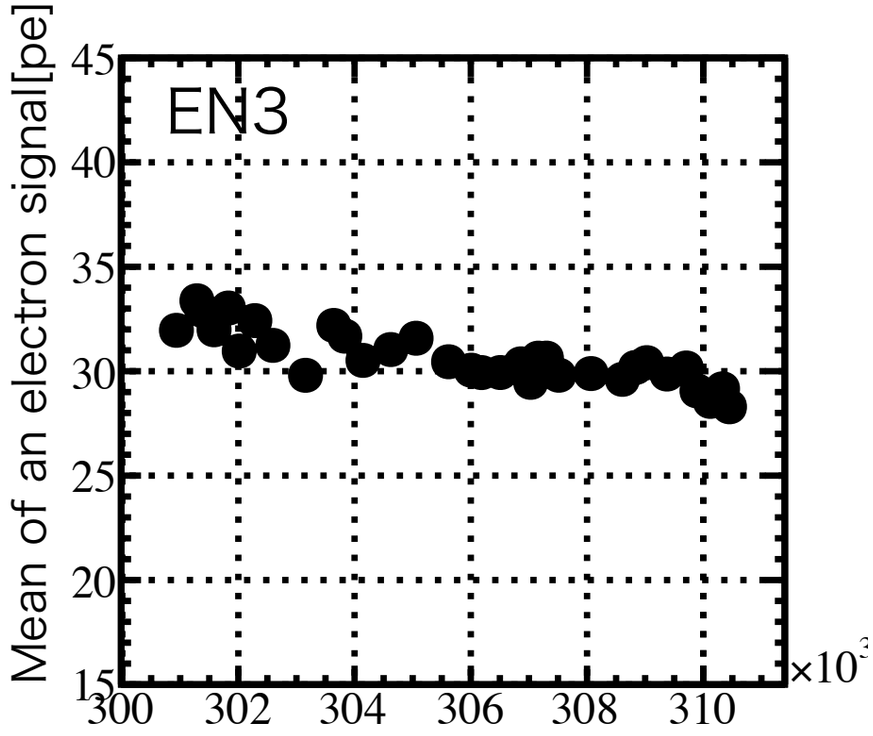


- All the module show jumps in <padcharge> at the same time.
- The jump seems to be due to beam property. What kind of beam property make these jumps?

slide from PLHF meeting

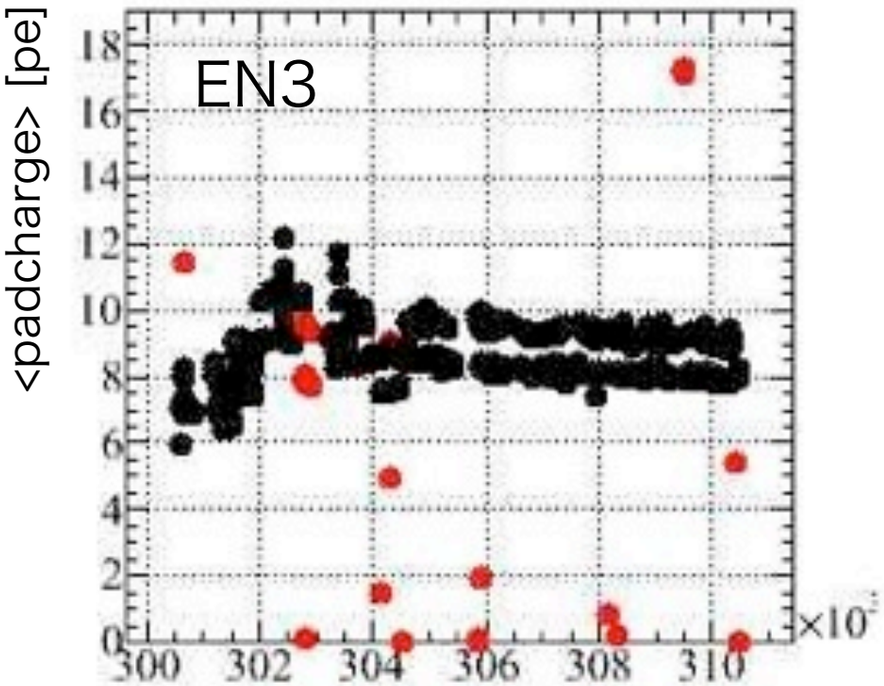
Slope

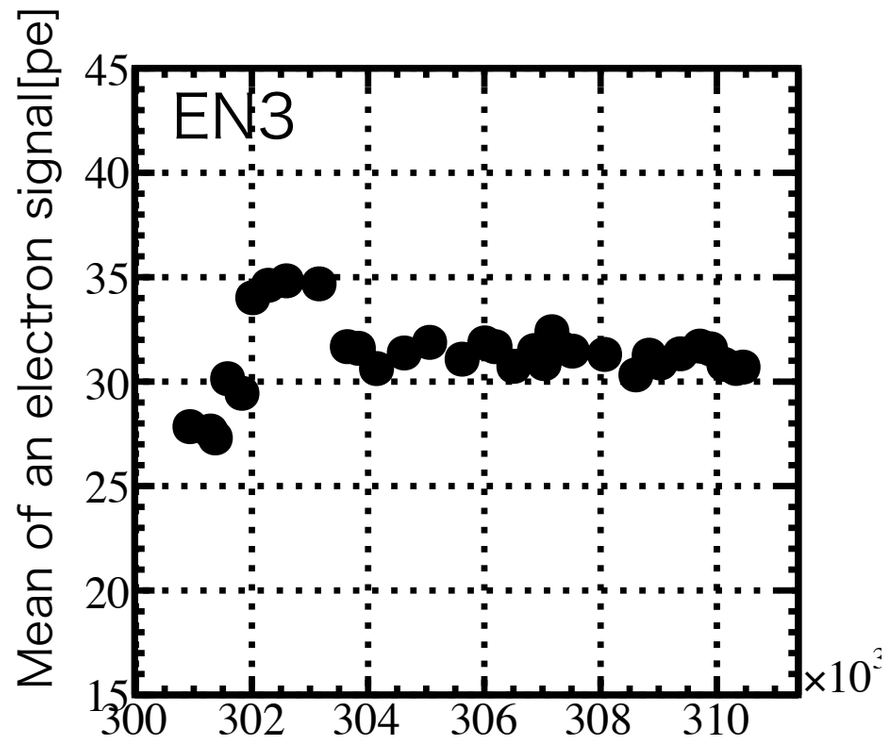




- Left: <pad charge> as a function of run number
- Right: Mean of an electron signal as a function of run number (20 runs are grouped into 1 group)
- They show the same behavior
- Figures for the other modules are placed on slide 12 and 13

Jump





- Left: <pad charge> as a function of run number
- Right: Mean of an electron signal as a function of run number (20 runs are grouped into 1 group)
- They show the same behavior
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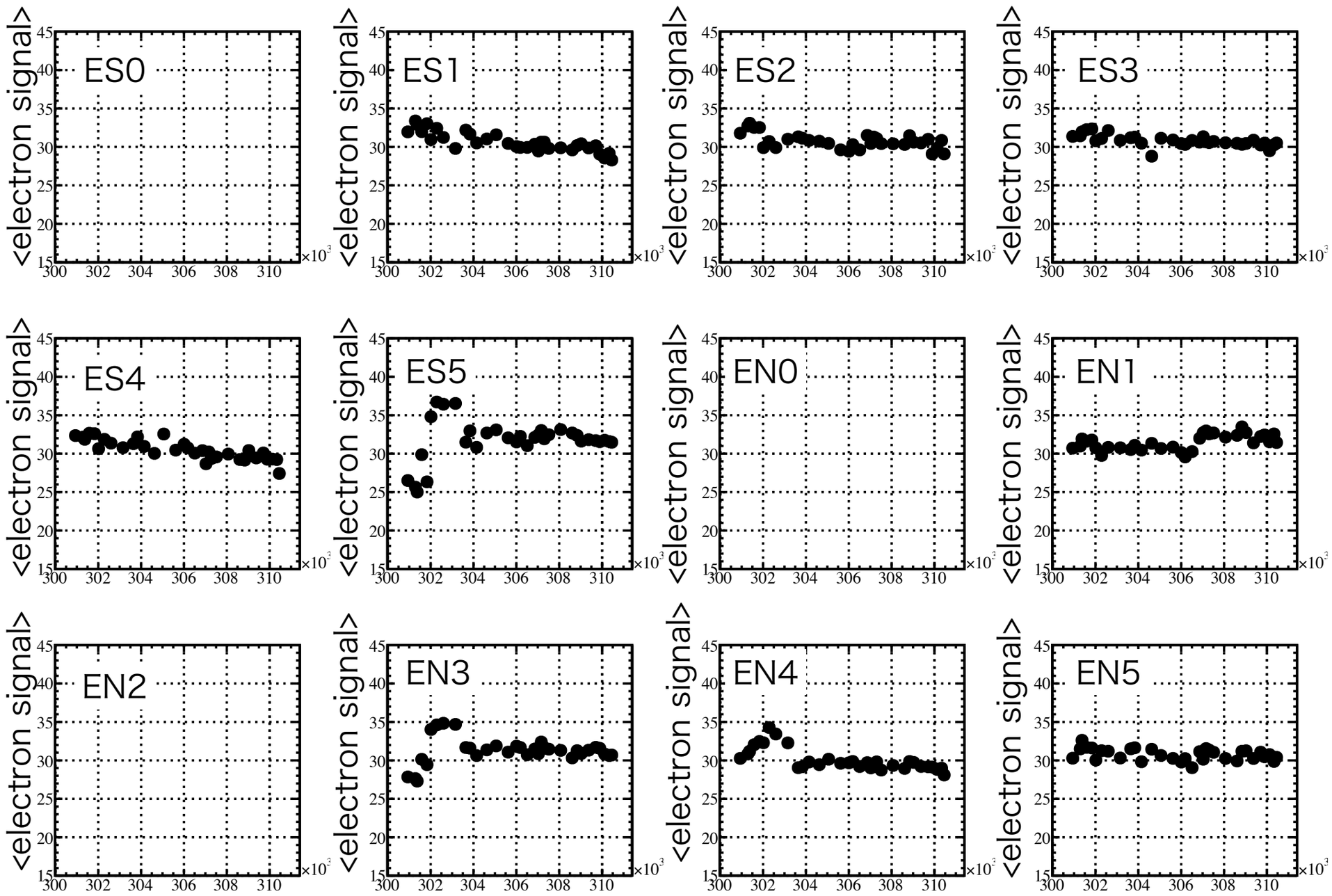
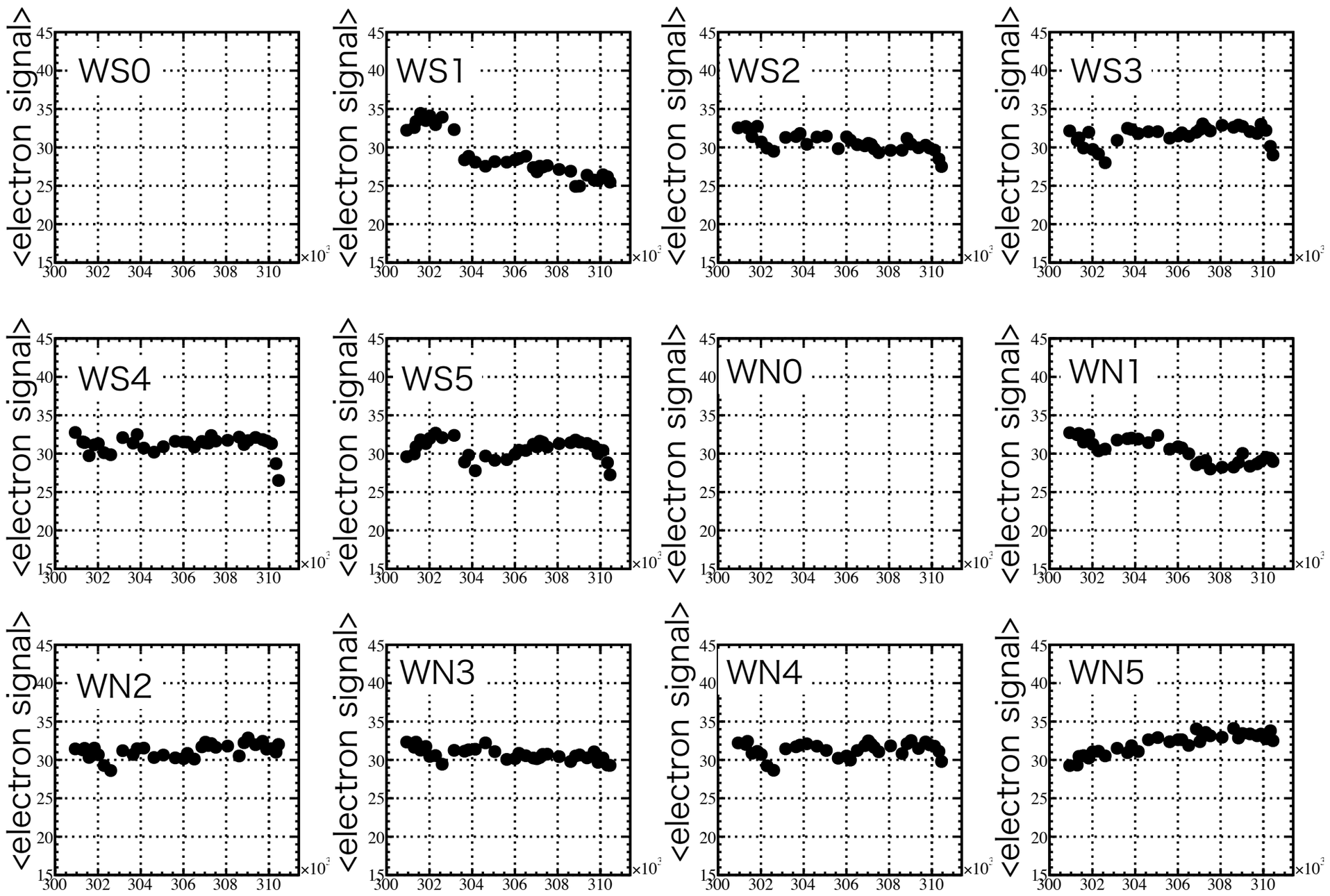
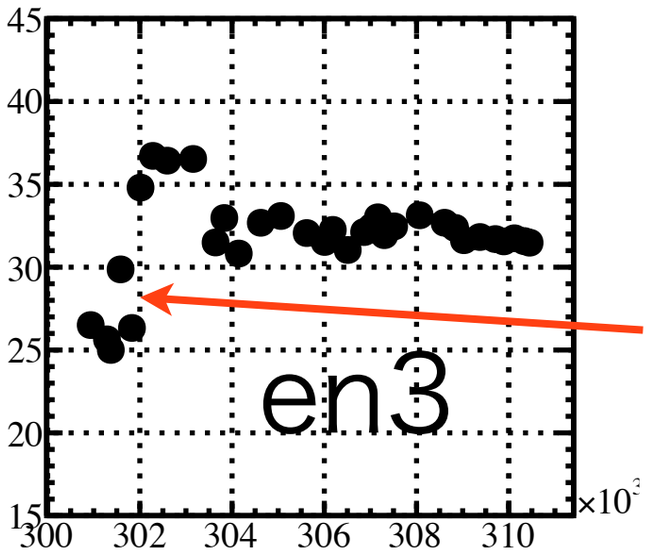
Mean of an electron signal (east)



Mean of an electron signal (west)



HBD Logbook



module with the same behavior: ES5,EN4

174	Wed Jan 20 14:58:53 2010	C.Woody	Increase of detector gains (East + West)

After our discussion at yesterday's meeting, we switched to the 4K gain file for the West detector, and sure enough, the gain slopes increased back up to ~ 6 as the were for Run 9 (well, for the most part...). WS5 is still about 4.2, WS1 is about 4.9, and WN5 is about 5.3. However, they are definitely more in line with Run 9 than before. I'm attaching an online monitor plot from this morning if you'd like to have a look at it.

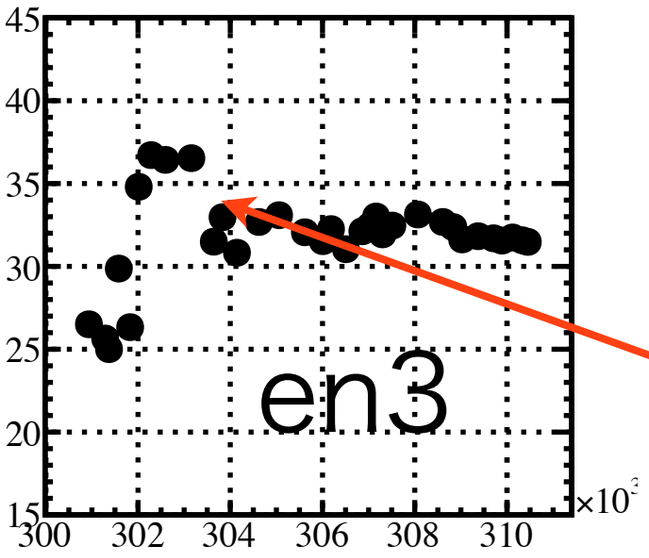
We also checked that we were indeed using the 4K gain file last run (a lesson to me not to trust my memory again...), but we also checked that what's in the file does not seem to imply a gain change of a factor of two over the 2K file. The typical voltage increases across the GEMs are ~ 6V, which implies a gain increase of ~ 50%, which is more like what we saw. Nevertheless, we set all the voltages in the West to the 4K gain settings and we are now running at the same set of voltages that we ran with last run (guaranteed...).

We also installed a file with a complete set of voltages for the East (2K, 4K, 6K, 8K and 10K, and all 5 P/T bins).

All of these voltages were calculated starting with the gain slopes measured for a particular run (301905) which were then scaled to the various gains and P/T values using the standard curves. These got implemented last night, and from the runs taken this morning, the gains are also higher as expected. I've attached the online monitor plots for the same run as for the West. If anything, some of them look a bit high, so I've calculated a new set of voltages which attempts to equalized them all to a value of 6 for the next iteration. We will install this today and try it after the APEX tests are finished later this evening.

As for the scintillation per pad, the results from that were rather mixed and confusing. When we went to the 4K file, the the raw scintillation peaks in some modules increase by almost a factor of 2, but others did not. It also seemed that somehow the north and south modules were behaving differently. This is still under investigation and eeds some more time to understand what is going on. In the meantime, we'll continue to set the gains using the slopes from the exponential fits, which should hopefully at least get us back to where the gains were set to last year.

HBD Logbook



module with the same behavior: ES5,EN4,WS1,WS5

179	Fri Jan 29 20:23:08 2010	C.Woody	New HV files + dV scan

Installed new HV files for both East and West with new lower P/T bin and eliminating highest P/T bin (still have five bins total). The new bin has the same spacing and bin width as all the others. The new file also has somewhat different voltages for the West than we ran with for Run 9, and also slightly different voltages for the East than we have been running with recently, but based on these recent runs, they should balance the gains somewhat better.

Performed a new dV scan (mainly to check if there was any effect from changing HV module for WN1, WN2, WN3 and WN4)

Run 303415 - 0V

Run 303416 - 5V

Run 303421 - 10V

Run 303422 - 15V

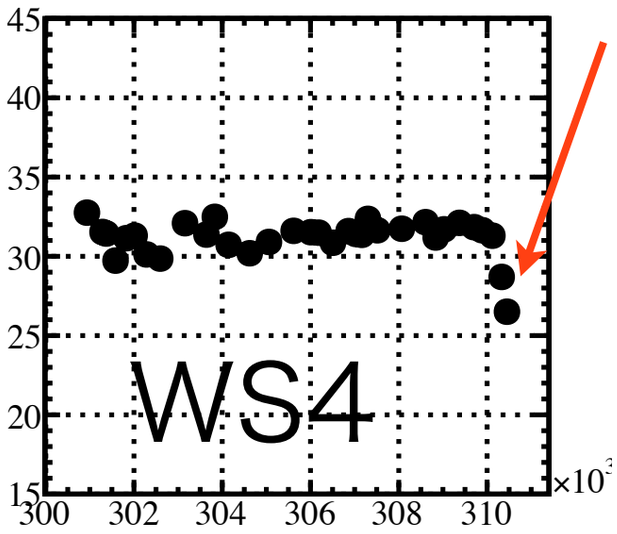
Run 303423 - 20 V

Run 303424 - 25 V

Each run ~ 2M events

- Why does GEM high voltage affect <electron signal> even after gain calibration? Collection efficiency of photoelectron?

HBD Logbook



module with the same behavior: WS2,WS3,WS5

187	Sat Mar 20 00:23:14 2010	B.Azmoun	WS4 Votlage set to 2K Gain values

WS4 gain exceeded 15 today (~15.2 high) for several runs at around 6 to 10pm, so the 4K voltage table was set to the 2K gain values for all P/T bins at around 10:30pm (3/19/10). The gain is now about half as expected, at around 6.

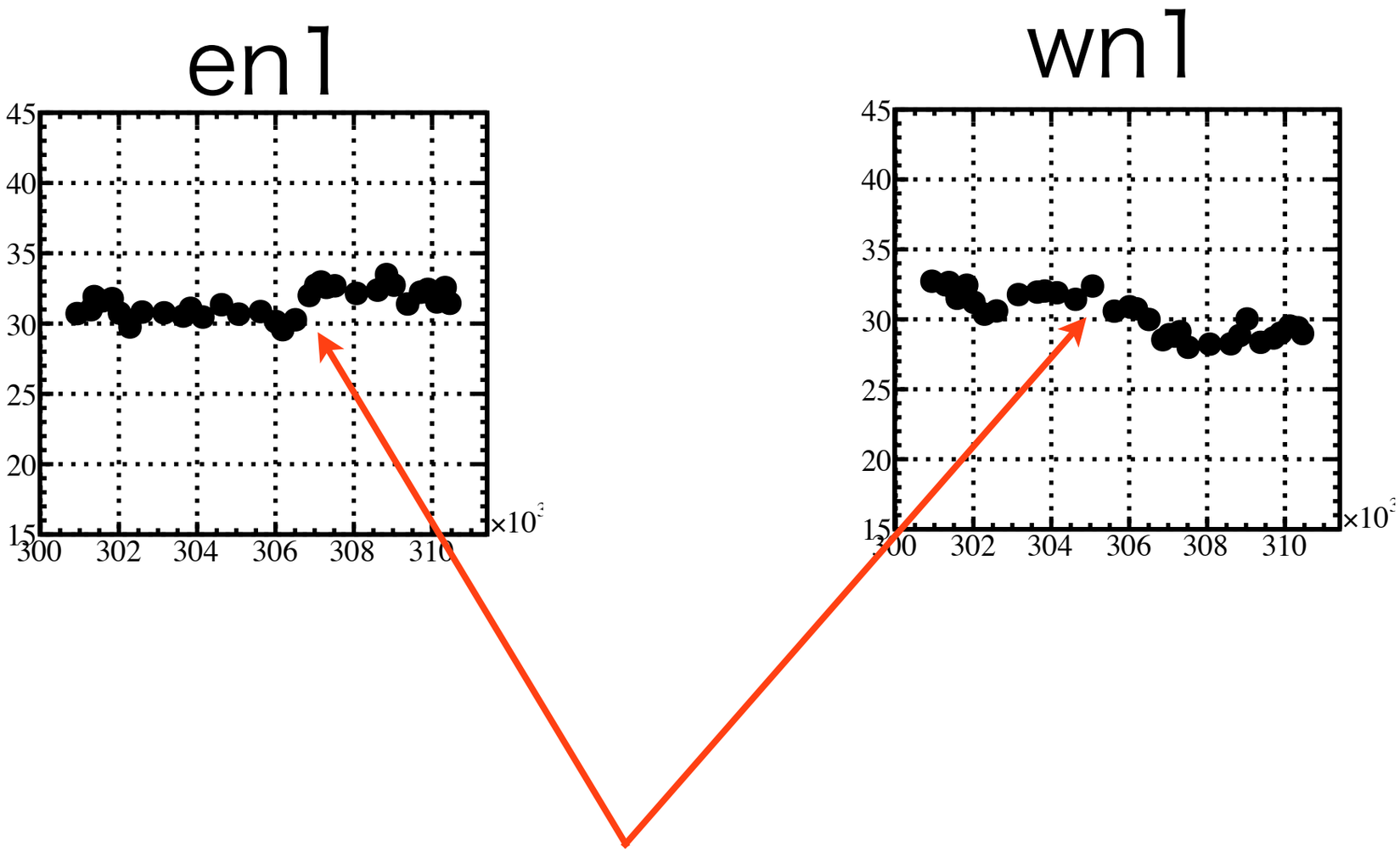
WS2-5 have all been showing high gain ever since Craig and John H. went into the IR on Tues. to adjust the setpoint of a flow detector interlock for the air flow tubes going to the the preamps for the WS quadrant of the HBD. The power to the preamps of this quadrant was shut off due to the sensitivity of this interlock around some threshold value. Craig and John simply adjusted this threshold value slightly and re-powered the preamps (which we do all the time). Afterward, the gains of the GEMs of this very quadrant all were high, much higher than all the other modules, and were out of the 5-8 ADC ch. range. Takao has confirmed that the redout is fine by doing a pedestal and pulser run, both of which look normal. This behavior is a mystery at the moment.

One thing we learned tonight: lowering the voltage did bring the apparent gain down, as mentioned above, whcih seems to indicate that the effect is truly due to gas gain, but how? What changed in these four GEMs that did not change in all the others? In addition, it shoudl be noted that the apparent gain was observed to change rather quickly and by a large amount: from one run to the next, for example, the gain was observed to go from 15 to 10 and back to 14.

186	Thu Mar 18 16:51:01 2010	B.Azmoun	HBD GasTransmittance Loss

Started to notice a gradual loss in transmittance in scans performed from 3/5 - 3/9 - 3/15. 3/15 scan showed ~92% integrated trans., down from 98% on 3/5 and earlier on. We hypothesized that this coud be due to either of two things: 1. Increased temp in gas house (due to the arrival of Spring) has increased the rate of outgassing in the input gas plumbing and has reduced the efficiency of the scrubbers (same problem observed last year), or 2) the Vac Ref. scan is outdated. When the 3/15 trans. was recalc. using newer Vac Ref. scan taken on 3/16, the input trans. improved to 95%, but there was still evident some absorbance due to water--so, the decreased absorbance seems to have been a result of a combibnation of the two hypothesees put forth earlier. Rob said he also lowered the input fresh CF4 flow rate into the system from 1.32slpm to 1.22 on the day just before we start to see a rise in the ppms of H2O in the input, according to the analyzers. Rob has now increased the fresh gas flow rate back to 1.32slpm (actually did this yesterday afternoon). Rob will also turn on the AC units that are inside the gas house since the temp there seems to have crept up to 72F, well above the 64F low-setpoint. The AC units currently have no thermostat, so it will take some time to get them working, but once they come online, we will have a high-Temp setpoint as well. Rob also suggested lowering the IR temp. by lowering the AC setpoints there by a few degrees--this will reduce the outgassing rates of the HBD vessels themselves, which will compensate for the water added on the input.

HBD Logbook



I could not find any entry in the logbook

Summary

- Two line structure
  - Beam property

    Slope and jump
  - Quantum efficiency(?) or something else
- Need quantum efficiency correction?
  - new charge = charge / quantum efficiency

Backup

Setup

- Data set: 200GeV 60-92% events
- CA eID cut
  - pt>0.2GeV
  - n0>=3,disp<5,chi2/npe0<25
  - |emcdphi|<0.03,|emcdz+1|<15
  - ecore/mom>0.6
- Clusterizer
  - WisClusterizer in CVS